UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: March 4, 1982

SUBJECT: Request for Comments; Pine Ford Project, Missouri

Big River Mine
MOD981126899
17.8
Pine Ford Proj.
3-4-82

FROM: Thomas L. Budd, Acting Assistant Regional Administrator for Policy and Management

TO: Alan Abramson, Director, Water Management Division
Dave Wagoner, Director, Air and Waste Management Division
John Wicklund, Director, Environmental Services Division

The St. Louis District Corps of Engineers has requested our response to several questions regarding benefits for water quality releases and controlling heavy metal contamination in the Big River Basin. The enclosed letter and data explain their request.

An answer to this letter is due March 15. I request your staffs prepare responses to those issues that affect your programs. Specifically:

WATR - Questions 1a, 1b, 1c, and 2.
ARWM - Questions 3a, 3b, and 3c.
ENSV - Any questions deemed appropriate to your program.

Please provide your responses to the ENRV Branch by March 10.

Little project-related information was provided in the letter. If your staff is unfamiliar with the Pine Ford Project, please contact Bob Fenemore for more information.

Enclosure

Labeled as Comments as per Bob Dana RF

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE

SUBJECT: Water Management Division comments on Pine Ford Reservoir

FROM: Carl V. Blomgren
for Chief, Water Compliance Branch

TO: Ed Vest
Chief, EIS Section

The basic language governing our position on this or any other situation regarding flow augumentation is found in Section 102(d) of the Clean Water Act. That section states that storage and water releases shall not be provided as a substitute for adequate treatment or other methods of controlling waste at the source.

Because the Big River downstream segments are expected to attain water quality standards after the imposition of adequate treatment, there are no water quality standards attainability benefits that could be attributed to flow releases. We are not aware of water quality data that indicates problems on the Big River to point sources and the Missouri DNR monitoring data in the State 305(b) report does not indicate water quality violations due to point sources. There is however, as acknowledged by the COE, significant nonpoint pollution attributed to the lead mining activities in the upper Big River area. We do not know of any evidence that has been presented to show regulated releases would help solve this nonpoint problem.

Therefore, we cannot conclude that regulated releases in the Big River would have a beneficial effect and our policy would remain as stated in our August 7, 1978, letter and Section 102(d) of the Act. Obviously, we can assign no dollar value to the benefit since we do not believe there would be a benefit for WQ standards attainability after adequate treatment is achieved.

I believe the above has answered questions 1, 1a, and 2 of the COE's letter. Our answer to the rest of the questions is as follows: (1b) Existing NPDES enforcement mechanisms are sufficient to assure "competent operation" of upstream municipal treatment systems and no benefit from the P.L. 91-611 provision should be recognized. (1c) No water quality standards "benefit" is recognized by EPA for emergency "flushing" capability.

Attachments

AUG 7 1978

Colonel Leon E. McKinney, USA
District Engineer
U. S. Army Engineer District, St. Louis
210 N. 12th Street
St. Louis, Missouri 63101

Dear Colonel McKinney:

We have received your letter of July 12, 1978, regarding low flow augmentation for water quality control from proposed reservoir projects in the Meramec River Basin.

We believe the letter indicates a lack of understanding on the part of the St. Louis District with regard to the provisions of PL 92-500 Environmental Protection Agency policy and guidelines in connection with Section 102 of the Act, and EPA planning activities being conducted pursuant to Section 208 of the Act.

Section 102(a) of the Act provides for joint investigation by EPA with other agencies of the discharges of any sewage, industrial wastes, or substances which may adversely affect navigable waters or groundwaters. Section 102(b) provides for consideration by EPA of the inclusion of storage for regulation of stream flow except that any such storage and water releases shall not be provided as a substitute for adequate treatment or other methods of controlling waste at the source. Section 208 establishes a planning process to identify both point and nonpoint sources of pollution and measures to control to the extent feasible such sources of pollution.

Determinations of the need for, and value of, flow regulation pursuant to Section 102(b) have previously been made for the St. Louis District on the proposed Union Lake and Pine Ford Lake. These determinations were made by letters of October 5, 1973, September 16, 1976, and October 28, 1976, copies enclosed. We had not received any request in connection with other projects within the basin prior to your letter of July 12, 1978.

WATR:WQPL:LDuvall:jmf:jll:5616:8-4-78: Retype/mem

WQPL	WQPL	WATR	RGAD
See Attached			

8/ /78

The 208 planning effort conducted by East-West Gateway was for the purpose of identifying both point and nonpoint sources of pollution and measures to control, to the extent feasible, such sources of pollution. It was not intended as a study of the need for and value of flow augmentation pursuant to Section 102(b) and the work plan did not provide for such a study.

We did advise you in our letter of October 29, 1976, the Corps of Engineers should assist East-West Gateway in exploring and quantifying nonpoint sources of pollution. We believe this was in keeping with not only the study purpose but the provisions of Section 102 of PL 92-500. In that same letter we stated flow augmentation would be justifiable only if direct point and nonpoint source control practices were determined to be insufficient to meet stream water quality standards.

We assume from your letter the Corps of Engineers did provide assistance to East-West Gateway, but the letter does not indicate what assistance was provided. It would appear that such assistance was directed toward obtaining an evaluation of flow augmentation as compared with controlling pollution at its source. We are somewhat surprised at this result in view of the purpose of 208 planning as expressed in PL 92-500 and our letters regarding the matter. We also are concerned the issue did not fully surface earlier in view of the participation of the Corps of Engineers on the Policy Advisory Committee of East-West Gateway during the course of the 208 study.

Your letter states in a meeting of May 12, 1978, with East-West Gateway, a study of flow augmentation as a supplementary measure was discussed, and the conclusion was reached that a study is needed. We would appreciate your comments on the basis for this conclusion (such as the pre-impoundment studies you mentioned), since the draft 208 plan does not appear to indicate flow regulation will be required to meet water quality standards when the recommendations of the 208 plan are implemented. In particular we would appreciate your advice as to whether your conclusions are based upon the possible need to augment flows for point or nonpoint sources and what specific pollutants are expected to violate water quality standards.

In the recent passage of PL 95-217 the requirement of Section 102(b) was not changed and hence the policy of EPA with regard to flow augmentation has not changed. The legislation has resulted in consideration of a broader range of treatment alternatives and control technologies. However, flow regulation is still to be considered, only as a supplementary measure to control of pollutants at the source.

We would appreciate a list of the specific proposed reservoirs that will require a determination of the need for regulation of stream flow. In addition, we would appreciate your making available copies of appropriate survey reports and feasibility studies in connection therewith.

It will be our intention to fully cooperate in these determinations within the limits of our resources and those of PL 92-500 and PL 95-217.

Sincerely yours,

Kathleen Q. Camin, Ph.D.
Regional Administrator

Enclosures

cc: James Odendahl, Mo. DNR
Richard Rankin, Mo. DNR

DRAFT

Date: March 9, 1982

Subject: Comments on the Pine Ford Project, Missouri

From: Director, Air and Waste Management Division

To: Thomas L. Budd, Acting Assistant Regional Administrator for Policy and Management

Regarding the above referenced project, my staff has prepared comments on questions 3a,3b, and 3c as requested. Additional information may be obtained from Katie Biggs or Richard Smith, Superfund Section.

3a. Recently WMBR has been asked to review and comment on several stream channel modification projects by the Corps of Engineers which may involve the dredging and disposal of sediments that may be hazardous under RCRA. The costs associated with disposal of these potentially hazardous stream sediments at a RCRA disposal facility are believed to be very high but no actual dollar amounts have been determined.

WMBR estimated the costs to transport and dispose of hazardous stream sediments for one project involving 38 miles of drainage ditches be excavating approximately 1.3 million cubic yards of sediments believed to be contaminated with heavy metals and pesticides. The estimated cost for transportation and disposal was $92 million, an obviously prohibitive cost compared to the total project cost of $3.7 million.

relaxing regs for disposing of river dredged Sediments; Not classify as hazar -date?

? WMBR has placed this issue before the Office of Solid Waste. EPA Region X has raised the same issue. We have comments from Headquarters that perhaps a neutral water leachate test may be applied to the sediments rather than the acid leach now required by the EP toxicity test procedures. However, we have not yet received written guidance.

3b. In order for funds to be expended under Superfund, the site must be on the National Priority List (NPL). The listing of a site on the NPL does not preclude the use of funds from state, local, and private sources to clean up the site. These sources of funds are preferred, especially the use of private funds, where a responsible party can be identified. If a responsible party cannot be identified, or if the responsible party is unable or unwilling to undertake remedial action, then Superfund monies can be used for remedial actions. This requires a state match of 50% for action at a public site and 10% for a private site or facility.

ST. Joe Mineral USE S.F when unident. Fed portion

Any porposal for Superfund should be coordinated with the State to assure the funding match will be available should responsible parties not be identified and Superfund monies are sought.

3c. WMBR has some data on tailings in the Big River area and we are aware that there may be river sediment studies done under the 208 program. We do not, however, have copies of this information. It would be best to have the project sponsor contact Dick Smith (374-6531) so that we can determine the types of information needed or sought as compared to that already available to the sponsor.

TP

Please note, the Superfund notification excluded mining wastes. The Superfund notification was limited in scope for program management reasons. However, this limitation does not extend to the Superfund legislation itself. The definition of hazardous substances under Superfund is extensive (CERCLA, Sec. 101(14)). It is possible that mining wastes which were excluded from the notification program could contain hazardous substances as defined by CERCLA and become a candidate for cleanup actions.

Heavy Metals.

EPA / State relations: State has lead in Big River since agreement with St. Joe Minerals. EPA provide overview of State action.

- State not identified area as an uncontrolled site; that is the first step toward Superfund.

- Superfund excludes mining wastes. HQ (CGC) allows for some flexibility in that ~~waste~~ certain hazardous substances may be in the mining waste that may qualify for Superfund $. TAR CREEK.

- Superfund best used when responsible party for the site cannot be found. State, private, local funds should be used when responsible party is known.

Recent HQ ruling: Oct '81 prohibited dumping of liquid hazardous wastes in the "interim approved" waste sites: Granted a 90-day suspension and allow filling up to 25% of volume & comments.

Eco Study – (Duluth) – data base development on organisms that have been tested with toxic materials

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF
LMSED-BF

25 February 1982

MAR 2 1982

Mr. John J. Franke, Jr.
Regional Administrator
US Environmental Protection Agency
324 East 11th Street
Kansas City, MO 64106

Dear Mr. Franke:

In July 1976, soon after we received initial Phase I planning funds for Pine Ford, an authorized lake project on the Big River, we contacted your agency and requested a revalidation of the benefits attributed to flow augmentation for water quality purposes on the lower Big River and in the reach of the lower Meramec River below the confluence with the Big River.

Although our representatives corresponded back and forth through September 1978, we were unable to resolve our differing interpretations of the PL 92-500 provisions, and the policy of EPA at that time dictated that flow augmentation had no benefit whatsoever as a water quality measure.

The Corps of Engineers then initiated an abbreviated water quality testing program to define the nature of the problem (if any) and to estimate the effects that could be achieved with flow augmentation. Unfortunately, nature was not cooperative in providing low flows that would establish a "worse-case" condition and as you may note from the inclosed data the results were inconclusive.

We are now in the final stages of reformulating the Pine Ford project and are examining a variety of plans in addition to the authorized lake plan. We expect to provide a draft report to our reviewing authorities in March 1982 and will complete the final Phase I General Design Memorandum in September 1982. From this schedule it is apparent that we are quickly approaching our final opportunity for presenting whatever beneficial water quality effects that might be associated with controlled releases from a reservoir plan.

In our own agency, we have observed a number of changes occurring in recent years; changes in problem-solving philosophy, changes in policy and, to be sure, changes in funding and staffing capabilities. If these same sort of changes have been experienced by EPA, perhaps it is now possible to consider measures that should have some beneficial effect, however limited, and which could be implemented at low cost and with high reliability as compared to expensive, state-of-the-art measures that may consume much energy and suffer from reliability problems, either due to the sophisticated technology or due

EPA

MAR 2 1982

to the high level of operator competence that might be required. In addition to these generalized changes, the Pine Ford situation has been altered by the heavy metals problems which have been recognized only since 1977 and which still have not been completely defined. In this regard, Mr. Bob Fenemore of your agency has been participating in the coordination meetings and briefings during the course of the heavy metals studies being conducted by the Columbia National Fisheries Research Laboratory.

Let me now get down to the purpose of this letter and address some questions for your consideration. Your reply will serve to document the current position of the Environmental Protection Agency in our draft report. Rx

1. On the basis of the inclosed test data and other data that may be available in your files, would your agency conclude that a pool with regulated releases in the Big River could have a beneficial water quality effect under the following circumstances:

a. Providing reliable minimum flows of a given dissolved oxygen content such that the natural assimilative or self-cleaning ability of the river would be maintained; with particular effect on non-point contaminants deriving from agricultural operations and individual home treatment systems.

b. Providing a vehicle by which to enforce competent operation of upstream municipal treatment systems. That is, if certain water quality parameters were required in the pool, the local assurances that we could require to be furnished prior to construction could specify certain operating standards. Once furnished, the assurances could be enforced as provided by Section 221 of Public Law 91-611.

c. Providing an emergency "flushing" capability in the event that treatment facilities downstream would malfunction and discharge untreated waste into the stream.

2. If you conclude that some benefit could be derived, we would appreciate your opinion as to the dollar value of the benefit or your suggestions as to how such a value could be computed.

3. In regard to the heavy-metals problems (preliminary test data were furnished by letter of 20 January 1982 to Messrs. Vest and Fenemore), we have assumed that some degree of Corps of Engineers involvement would derive from the fact that Congress originally authorized a lake project and that such a project could not serve the anticipated purposes of recreation and fish and wildlife conservation without first controlling the heavy metals situation. For cost-benefit analysis, we have also assumed that, since the environmental/fish and wildlife benefit of controlling the contamination would not be quantifiable, we could assign a benefit equal to the cost of remedial measures. In effect then, we would be evaluating the various measures on the basis of effectiveness and least cost.

LMSED-BF 25 February 1982
Mr. John J. Franke, Jr.

a. Could your agency support this assumption that costs would be equally offset by benefits?

b. If we would recommend a lake project and necessary remedial measures for controlling heavy metals, a source of funds for accomplishing the measures could be problematic. You might well appreciate that this would be an unprecedented activity for the Corps of Engineers although some parallel comparison might be made with strip mine reclamation activities. In any event, your comments would be appreciated concerning potential funding sources; with particular reference to the "super fund" and pending legislation related thereto.

c. It has also come to our attention that the EPA has recently contracted for studies pertaining to heavy metals within the study area. If any results, preliminary or otherwise, are available we would be very much interested in receiving them as soon as possible.

I realize that I have asked difficult questions and that time will not permit the type of detailed analysis that you would prefer to accomplish and that we would prefer to receive. Nevertheless, I would appreciate your earliest consideration of these matters and receipt of your response in sufficent time (say by 15 March 1982) to be included in our draft report.

Sincerely,

ROBERT J. DACEY
Colonel, CE
District Engineer

1 Incl
As stated

Copy Furnished:
Mr. Bob Fenemore
US Environmental Protection Agency
324 East 11th Street
Kansas City, MO 64106

MERAMEC STUDY
EUREKA

STATION 1

Date 1979	Time	Air Temp °C	H_2O Temp °C	D.O. mg/l	pH	Weather	Flow cfs X Daily	BOD mg/l	Alkalinity mg/ $CaCO_3$	COD mg/l	NO_3-N mg/l	NH_3-N mg/l	O-PO4 mg/l	T-PO4 mg/l	T-Hardness mg/l $CaCO_3$	Con-dutance umhos/cm	Turbidity NTU
6/13	1250	28	23	8.4	7.6	PC	1610										
6/14	0700	21	22	6.0	7.1	S	1530	1.2	166	5	.19	.10	LT .01	.07	192	392	3
6/14	1530	30	25	9.7	7.8	S	1530										
6/15	0650	22	24	6.7	7.6	S	1450	2.1	168	5	.16	.01	LT .01	.04	190	383	6
6/27	1700	30	24	10.1	7.5	OC	1050										
6/28	0700	23	23	5.5	7.5	OC	1040	2.0	174	5	.25	.01	LT .01	.03	204	377	3
6/28	1730	19	22	7.5	7.6	R	1040										
6/29	0700	20	21	5.6	7.3	OC	1130	1.5	172	3	.29	.01	LT .01	.04	187	371	6
7/16	1730	31	30	8.8	7.4	S	748										
7/17	0730	21	25	6.2	7.7	S	734	1.3	171	2	.01	LT .01	LT .01	.04	138	379	4
7/17	1500	30	29	9.6	6.5	S	734										
7/18	0745	17	25	6.4	7.5	S	715	1.2	168	LT 1	LT .01	.01	LT .01	.05	146	385	5
7/18	1500	28	28	10.1	6.5	S	715										
7/19	0700	19	25	6.6	7.6	S	700	1.5	173	4	.01	.01	.02	.06	144	388	5
7/19	1545	29	27	9.9	6.7	S	700										
7/20	0730	21	24	6.7	7.6	S	690	1.1	189	2	.01	LT .01	LT .01	.04	152	393	4
8/13	1555	31	25	7.5	6.5	PC	4090										
8/14	0710	15	23	6.9	6.8	S	2710	1.7	82		.28	.02	.01	.14	50	205	48
8/14	1700	17	23	7.6	6.8	R	2710										
8/15	0730	17	22	7.9	7.6	R	1830	.9	110		.33	.01	.01	.09	96	258	25

Good D.O. until Fri. D.O. [illegible]

Incl. 1

MERAMEC STUDY
SULLIVAN

Date 1979	Time	Air Temp °C	H_2O Temp °C	D.O. mg/l	pH	Weather	Flow cfs X Daily	BOD mg/l	Alkalinity mg/ $CaCO_3$	COD mg/l	NO_3-N mg/l	NH_3-N mg/l	O-PO4 mg/l	T-PO4 mg/l	T-Hardness mg/l $CaCO_3$	Con-dutance umhos/cm	Turbidity NTU
6/13	1440	31	22	9.3		PC	757										
6/14	[illegible]	15	20	7.7	7.7	C	697		145	6	.25	.01	LT .01	.02	160	316	2
6/14	1350	28	22	9.4	7.9	S	697										
6/15	0940	21	21	7.7	7.7	S	651		147	6	.25	LT .01	LT .01	.02	158	305	1
6/27	1600	27	22	8.9	7.2	OC	441										
6/28	0830	18	21	7.5	7.4	OC	506	1.1	160	3	.37	LT .01	LT .01	.02	168	318	1
6/28	1400	23	22	8.2	7.4	R	506										
6/30	0930	19	20	6.9	7.6	OC	574		128	12	.36	.01	.02	.08	142	314	17
7/16	1600	32	28	8.3	7.0	S	332										
7/17	0545	18	28	7.0	7.3	S	320		164	1	.17	.01	.01	.05	132	344	11
7/17	1620	29	28	8.0	7.0	S	320										
7/18	0545	12	24	6.8	7.6	S	309	.6	164	1	.18	.01	.02	.04	130	344	1
7/18	1610	28	25	8.3	7.[illegible]	S	309										
7/19	0545	13	22	7.1	7.1	S	302		165	1	.17	LT .01	LT .01	.03	130	344	1
7/19	1630	28	25	8.8	7.[illegible]	S	302										
7/20	0545	14	25	7.5	7.6	S	287		165	LT 1	.14	LT .01	LT .01	.05	131	342	4
8/13	1650	27	22	9.7	6.4	S	758										
8/14	0830	16	21	8.4	7.3	S	630		135		.29	.02	LT .01	.04	118	291	19
8/14	1700	21	22	6.8	6.6	C	630										
8/15	0930	15	21	8.3	6.9	R	860		137		.27	.02	LT .01	.32	104	291	60

MERAMEC STUDY
UNION

Date 1979	Time	Air Temp °C	H_2C Temp °C	D.O. mg/l	pH	Weather	Flow cfs X Daily	BOD mg/l	Alkalinity mg/ $CaCO_3$	COD mg/l	NO_3-N mg/l	NH_3-N mg/l	O-PO4 mg/l	T-PO4 mg/l	T-Hardness mg/l $CaCO_3$	Con-dutance umhos/cm	Turbidity NTU
6/13	1340	37	24	7.8		PC	128										
6/14	0930	17	22	6.3	7.5	S	121		130	8	.13	.01	LT .01	.04	137	273	3
6/14	1445	28	24	7.7	7.5	S	121										
6/15	0830	21	23	5.9	7.4	S	115		111	11	.11	LT .01	LT .01	.04	130	275	3
6/27	1530	28	24	8.9	7.4	CC	166										
6/28	0830	20	22	6.8	7.4	CC	160	1.2	133	8	.14	.01	.01	.05	142	280	3
6/28	1445	25	22	7.7	7.8	R	160										
6/29	0830	19	21	6.3	7.5	CC	161		111	12	.22	.04	.05	.18	121	278	19
7/16	1700	31	30	7.9	7.9	S	48										
7/17	0845	21	28	6.3	7.4	S	45		126	4	.02	.01	.02	.08	114	260	4
7/17	1530	30	29	7.7	7.1	S	45										
7/18	0845	18	25	6.3	7.7	S	42	1.3	130	5	.01	.03	.03	.08	100	308	3
7/18	1545	33	28	7.8	7.1	S	42										
7/19	0845	15	23	6.4	7.2	S	39		137	8	.01	.02	.01	.08	104	308	4
7/19	1545	27	26	7.9	7.4	S	39										
7/20	0845	19	23	7.2	7.6	S	38		136	5	.01	.02	.02	.09	112	312	3
8/13	1600	27	24	7.0	6.4	S	1440										
8/14	0835	18	22	7.5	6.9	S	541		36		.28	.03	.02	.14	3	103	36
8/14	1600	21	24	6.9	6.6	C	541										

8/15 No Sample

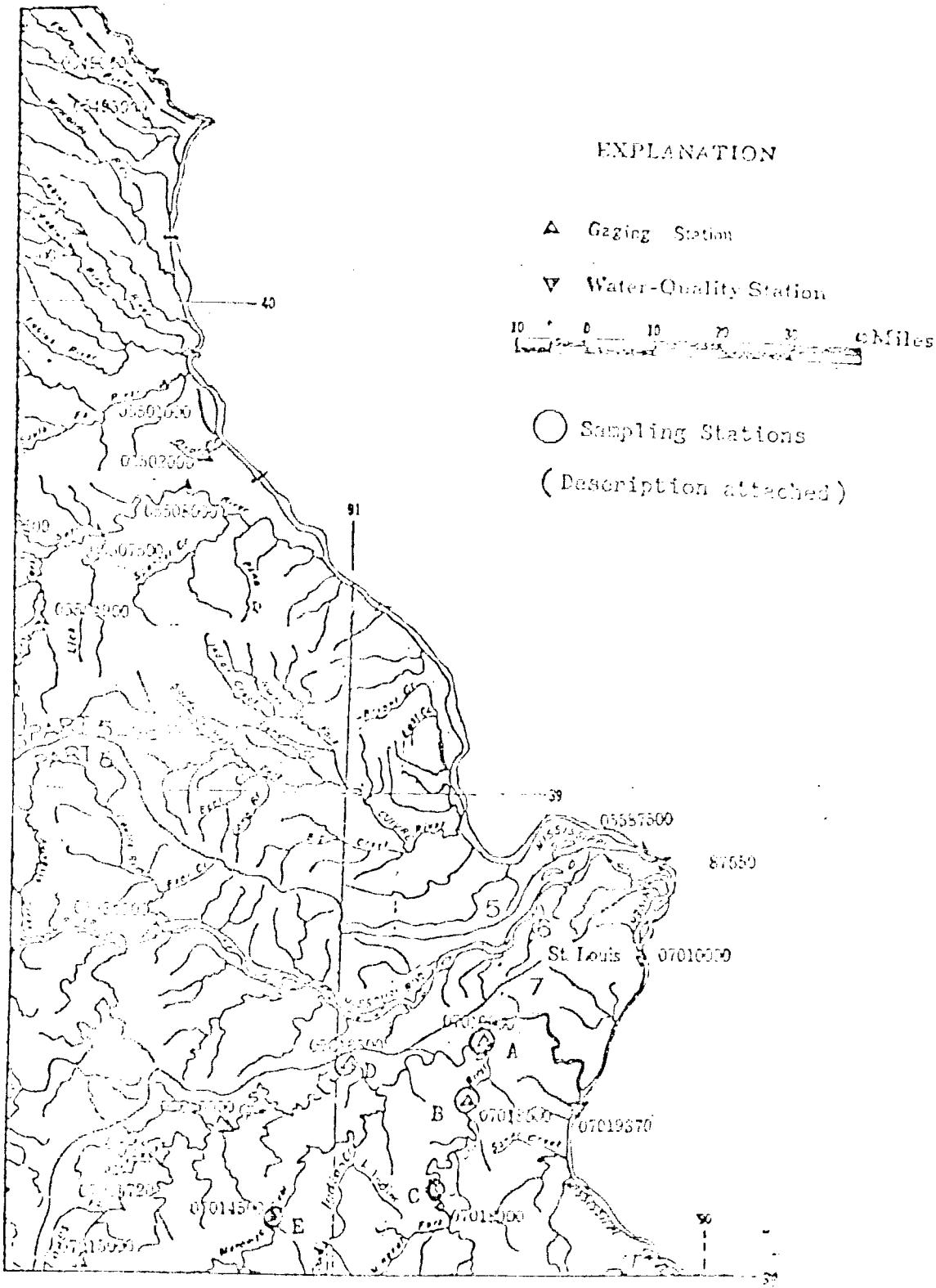
MERAMEC STUDY
BROWNS FORD

Date 1970	Time	Air Temp °C	H_2O Temp °C	D.O. mg/l	pH	Weather	Flow cfs X Daily	BOD mg/l	Alkalinity mg/ $CaCO_3$	COD mg/l	NO_3-N mg/l	NH_3-N mg/l	O-PO4 mg/l	T-PO4 mg/l	T-Hardness mg/l $CaCO_3$	Con-dutance umhos/cm	Turbidity NTU
5/13	1500	27	21	8.4		PC	286										
5/14	0630	13	21	7.6	7.7	S	251		215	7	.31	LT .01	LT .01	.04	254	385	4
5/14	1445	30	24	10.2	7.9	S	241										
5/15	0530	16	22	7.5	7.7	S	227		217	7	.25	LT .01	LT .01	.04	253	331	5
5/27	1600	33	24	8.1	7.4	PC	160										
5/28	0615	19	24	7.7	7.4	PC	174	1.9	226	4	.26	.01	LT .01	.04	268	485	4
5/28	1630	25	25	7.7	7.6	P	174										
5/29	0615	19	23	7.5	7.5	C	197		222	9	.29	LT .01	LT .01	.05	270	475	4
7/16	1600	32	30	8.1	7.2	S	142										
7/17	0630	21	27	7.2	7.5	S	135		211	3	LT .01	LT .01	LT .01	.05	206	484	3
7/17	1545	31	29	8.4	7.3	S	135										
7/18	0630	18	26	7.6	7.7	S	130	1.4	214	6	LT .01	LT .01	LT .01	.05	212	510	4
7/18	1545	29	28	7.8	7.1	S	130										
7/19	0645	14	25	7.5	7.6	S	127		217	5	LT .01	LT .01	LT .01	.07	220	515	4
7/19	1645	26	27	8.6	7.5	PC	127										
7/20	0635	14	25	7.3	7.7	S	123		214	3	LT .01	LT .01	LT .01	.05	207	482	4
8/13	1730	26	24	9.8	6.8	PC	191										
8/14	0540	17	22	7.9	7.3	S	179		206		.09	LT .01	LT .01	.04	200	461	17
8/14	1555	25	24	9.5	7.2	C	179										
8/15	0545	17	21	8.0	8.0	R	328		199		.09	.03	LT .01	.05	190	463	12

MERAMEC STUDY
BYRNESVILLE

Date 1979	Time	Air Temp °C	H_2O Temp °C	D.O. mg/l	pH	Weather	Flow cfs X Daily	BOD mg/l	Alkalinity mg/ $CaCO_3$	COD mg/l	NO_3-N mg/l	NH_3-N mg/l	O-PO4 mg/l	T-PO4 mg/l	T-Hardness mg/l $CaCO_3$	Con-dutance umhos/cm	Turbidity NTU
6/13	1700	27	24	7.3		PC	315										
6/14	0815	15	23	8.0	7.5	S	294		239	5	.20	.01	LT .01	.05	252	474	3
6/14	1525	31	24	8.7	7.3	S	294										
6/15	0815	16	24	7.9	7.7	S	285		238	8	.26	LT .01	LT .01	.04	250	477	10
6/27	1[illegible]	27	24	8.6	7.1	CC	138										
6/28	0[illegible]	19	22	6.6	7.1	CC	190	35	229	4	.20	.01	LT .01	.03	274	474	3
6/28	1[illegible]	28	23	7.8	7.0	CC	190										
6/29	0540	16	21	6.9	7.3	C	197		215	7	.24	LT .01	LT .01	.04	254	477	6
7/16	1600	31	28	8.0	6.9	S	163										
7/17	0[illegible]	19	25	6.5	7.3	S	155		219	3	.11	LT .01	LT .01	.04	212	506	3
7/17	1[illegible]	34	27	8.4	7.0	C	155										
7/18	0[illegible]	11	24	6.4	7.8	S	148	1.0	222	3	.10	LT .01	LT .01	.03	216	510	3
7/18	1[illegible]	28	26	8.7	6.5	S	148										
7/19	0545	11	23	6.6	7.6	S	142		224	2	.09	LT .01	.02	.04	224	517	3
7/19	1730	24	25	8.8	7.1	PC	142										
7/20	0545	12	23	6.7	7.7	S	136		226	1	.07	LT .01	LT .01	.04	230	506	3
8/13	1365	27	24	7.6	6.5	S	461										
8/14	0620	15	23	7.8	7.3	S	371		143		.20	.02	LT .01	.07	120	323	15
8/14	1625	21	24	8.3	7.0	C	377										
8/15	0[illegible]	18	22	6.9	8.1	F	535		178		.20	.04	LT .01	.05	162	398	12

APPENDIX I


EXPLANATION
Gaging Station
Water-Quality Station
10 0 10 20 30 Miles
Sampling Stations
(Description attached)
40
91
39
05587500
87650
St. Louis
07010000
A
B
C
D
E
07019670

APPENDIX I

Description of Sampling Stations

Station Designation	USGS or Corps Station No.	Stream Name & Description
A	U.S.G.S. 07019000	Meramec at Eureka
B	U.S.G.S. 07018500	Big River at Byrnesville
C	Corps Big River Sampling Sta. No. 4	Big River
D	U.S.G.S. 07016500	Bourbeuse
E	U.S.G.S. 07014500	Meramec